

University Nanosat Program

Overview / Lessons Learned

4 Apr 02



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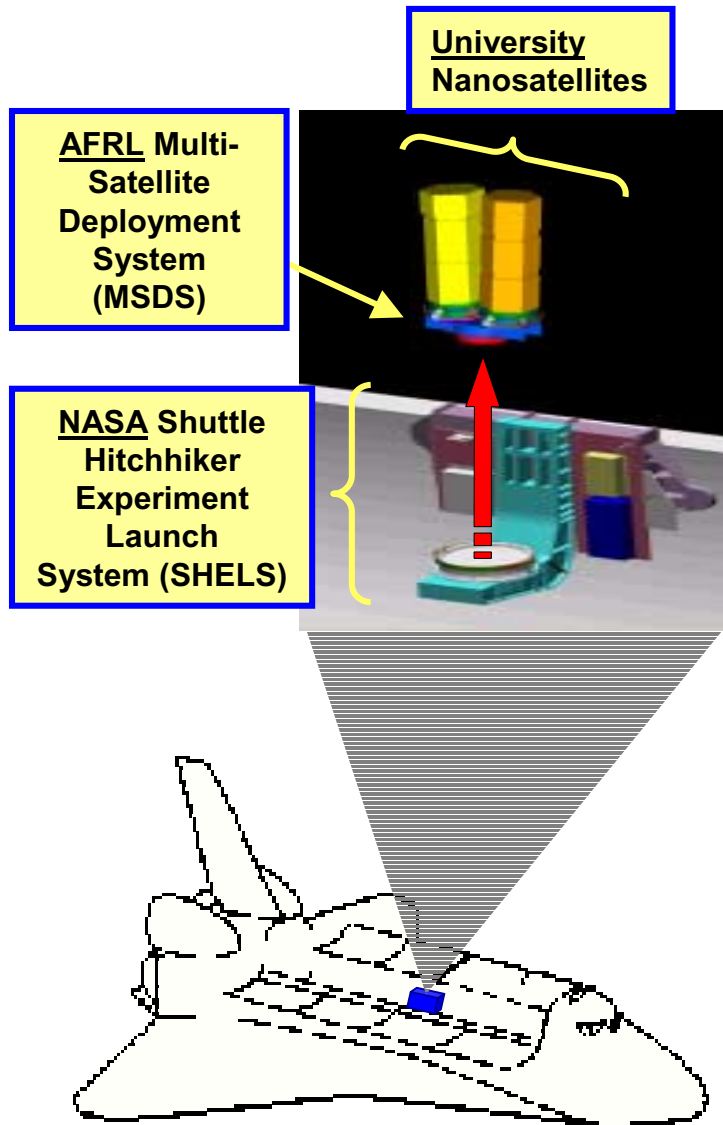
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University NanoSat Program Overview



• OBJECTIVES:

- Implement a Standard Deployment System for Small Satellites with Rapid Launch Capability at Low Cost – Allows for Advanced Technology Demonstration Through Space Flight
- Future Workforce Training Through Univ / Gov't / Industry Partnered Nanosat Development Efforts
- Demonstrate Miniaturized Component and Collaborative Formation Flying Nanosatellite Technologies (Support Techsat-21 Program)

• DESCRIPTION:

- Eleven U.S. Universities Are Producing Eleven Nanosatellites
- The Nanosats are Organized into Subclusters for the Purposes of Demonstrating Various Technology and Science Measurement Capabilities – Space Shuttle is Launch Vehicle
- Partnership Between DoD / NASA / Universities / Industry – Significant Leveraging for all Partners

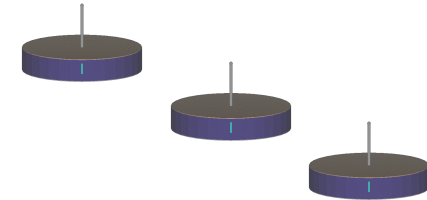


University NanoSat Program

Participating Universities



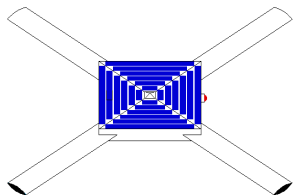
Program	Institution
Emerald	Stanford U Santa Clara
Orion	MIT Stanford U
ION-F	Utah State U U of Washington Virginia Tech
Three Corner Sat	Arizona State U U of Colorado at Boulder New Mexico State U
Solar Blade	Carnegie Mellon U
Constellation Pathfinder	Boston U



Constellation
Pathfinder



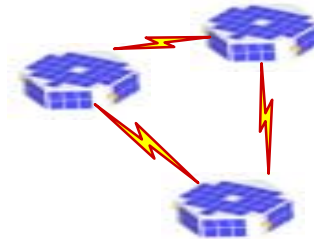
Orion



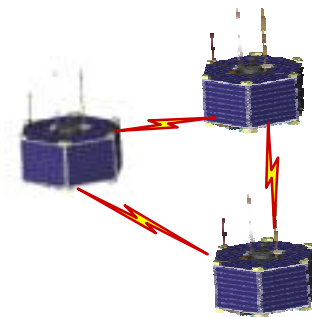
Solar Blade



Emerald



ION-F



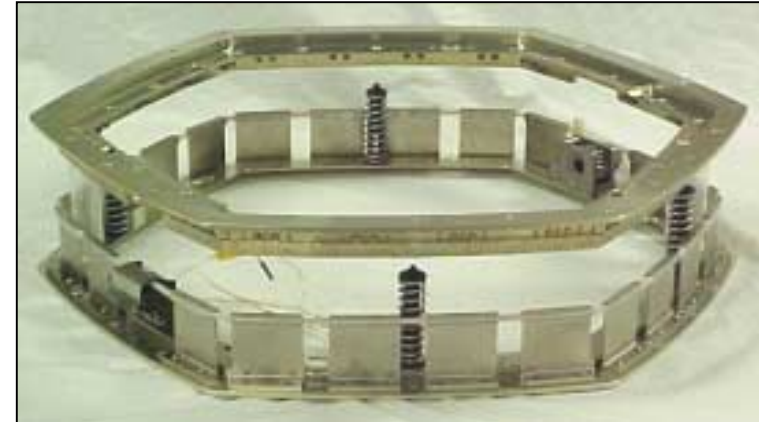
3-Corner Sat



Current Flight (NS-2) Component Summary



MSDS



Lightband Separation System



3CS Stack



Starsys Separation System



University Nanosat Program Lessons Learned



- **Gov't / University partners must be realistic**
 - Things cost what they cost (\$\$ and schedule)
 - Focus on incremental progress
 - Focus of Universities is on educating
 - Focus University effort on experiments
 - Standardize on basic components such as bus, battery, solar cells, etc.
- **Universities have a great deal of difficulty in meeting schedule**
 - Universities met cost constraints fairly well
 - Contractor support has helped significantly in the past



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Lessons Learned



- **Government / University partnership is not a contractual relationship**
 - A different approach is required – possibly a “whoever shows up gets to fly” approach
- **Avoid Shuttle if possible; may not be possible due to infrequent launch opportunities**
 - Minimize payload / Shuttle interface
- **Student workforce turnaround is 2 years**
 - Student support is highly dependent on school schedule
- **ITAR restrictions can be problematic**



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Lessons Learned



- **What Worked Well:**
 - Get mentors in the loop: satellite fabrication classes, sending qualified personnel on-site
 - FTP site worked very well for communication
 - Use of GSFC supplied fasteners
 - Students are very interested in, and can learn a great deal from, participating in I&T activities
- **What Didn't Work:**
 - University teams do not have certain capabilities – these must be acquired elsewhere
 - Thermal/Structural design – specifically FEA
 - Batteries, shipping



University Nanosat Program

Lessons Learned



- **Future Mission Planning**
 - Little / no thought has been given to the ground segment
 - Use of ETU / EDU's
 - Institute go / no go milestones
 - Universities / Government need to carefully focus effort – will significantly reduce design cycle timeframe